EcoStation to Restore Groundwater
At Mass Military Reservation Superfund Site
RFR ID: EEA 09 NRD 01

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Abstract
John Todd Ecological Design is proposing an integrated natural treatment system to be installed on the Massachusetts Military Reservation to restore the groundwater and aquifer contaminated with perchlorates. Housed in a 3,500 ft^2 greenhouse, the system will include an innovative sequence of tank based Eco-Machine™ technology, Hydros Injection BioReactors, fermentation tanks, and mycelium cells to remove the perchlorates of the pumped water. This system is unique in its use of natural ecologies to remove the perchlorates, as well as integrating multiple technologies to ensure success. The system uses a small, potentially mobile footprint, with limited chemical and energy usage, and is designed to be duplicated at similar sites. John Todd Ecological Design and Hydros are both based out of Falmouth, MA, giving them personal invested interest in this project. The expected Textron/MMR NRD funds are estimated to be $665,000 for two years, including operation assistance.

Site Description
The Massachusetts Military Reservation (MMR) is a 22,000-acre military facility on western Cape Cod. The MMR overlies the Cape Cod aquifer. The aquifer is composed mostly of sandy, unconsolidated sediment. At the MMR, the sediments are 150 to 300 feet thick and overlie crystalline bedrock. The only source of water to the aquifer is precipitation. About 48 inches of precipitation falls annually on western Cape Cod, and about 26 inches per year recharges the unconsolidated sediments; the remainder is lost to evaporation and transpiration. The recharge forms a water-table mound with the highest point, about 70 feet above sea level, on the eastern side of the MMR. Kettle ponds occupy depressions where the land surface intersects the water table. Groundwater flows radially outward from the top of the mound to discharge areas at wells, ponds, streams, wetlands, and the coast (Masterson and Walter 2000). The average rate of ground-water flow is about 1-2 feet per day. (USGS 2007)

Military activities, primarily from the 1940s to the 1970s, introduced chemical wastes into the Cape Cod aquifer that formed plumes of contaminated ground water. The plumes (shown in blue on the adjacent map) originating from the southern 8,000 acres include industrial solvents, fuel compounds, landfill leachate, and treated municipal wastewater (Installation Restoration Program of the Air Force Center for Engineering and the Environment). The plumes (shown in green on the adjacent map) originating from the northern 14,000 acres of the MMR are mostly from the use and disposal of munitions at Camp Edwards and include explosive compounds (RDX and HMX) and perchlorate (Impact Area Groundwater Study Program). The Impact Area Groundwater Study Program is cleaning up contaminated soil and ground water for the northern plumes. At the end of 2006, nine extraction wells were pumping a total of 1.4 million gallons per day from three plumes to remove and treat contaminated ground water and return it to the aquifer. (USGS 2007)

The restorative EcoStation is proposed for a 1.5-acre area on the northwest area of the Massachusetts Military Reservation. The location of the project reflects the relevant USGS map of perchlorate plumes, specifically a large plume that feeds into the Cape Cod Canal in close proximity to the Bourne Bridge. The map of the plume according to USGS studies, and proposed location of the Restorative EcoStation are illustrated in Appendix A. This specific area will be the target of ecological restoration. The infrastructure of the restoration systems will consist of a

single greenhouse structure with a footprint of approximately 4,000 square feet. All parties on this design team are in agreement that focus on this specific area poses the largest magnitude of benefits given relevant hydrologic data and information.

Project Goals and Objectives

As much of the proposing team are long term Cape residents, we recognize that there are tangential issues in addition to the perchlorates such as nitrogen in our saltwater estuaries that has been devastating to our eel grass communities, and phosphorous which has been a factor in the continued degradation of our freshwater ponds. Ecological design principals mandate that there be redundancies both in our process and the benefits to the human population as well as the environment. The perception that there are redundancies to treat the perchlorates would be accurate. The intention of the redundancies is both to assure that we meet the goals of eliminating the perchlorates from the water but also provide local residents with the tools to use what is proposed on this site and restore satellite areas or duplicate the EcoStation and implement these sustainable practices elsewhere.

Table 1: Milestones

Operations and time line illustrating EcoStation technology development and implementation

Months 1 3 6 9 12 15 18 21 24

Background Nutrient Collection xxxxx x

Natural Microbial Library xxxx

System Stability Studies xxxxx

Nutrient Analyses xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Nitrogen Removal Characterization xxxxxxx xxxxxxxxxxx xxxxxxxx

System Monitoring xxx xxx xxx xxx xxx xxx xxx xxx

System Validation xxxxxxxxxxx

Table 2: Activities and Team Responsibilities

Activity	Responsibility	Activity Period
Base Line Nutrient Measurement	Hydros, JTED	1-2 weeks
Green House Installation	JTED, Hydros	1 week
Microbial Growth Initiation	Hydros	2 Weeks
Near field Nutrients	Hydros, Barnstable County	Each Week
Down Stream Nutrients	JTED, Hydros, Barnstable County	Each Week

Calibration	Hydros, JTED	1 Week
Near field Nutrients	Hydros, Barnstable County	Each Week
Total System Start	JTED, Hydros	1 Week
Near field Nutrients	JTED, Hydros, Barnstable County	Each Week
Down Stream Nutrients	JTED, Hydros, Barnstable County	Each Week
EcoMachine Construction	JTED	2 Weeks
Planting Scheme & Ramp Up	JTED	2 Weeks
Sustainable Site Consulting	JTED, CDF	1 week

Process Flow for The MMR Restorative EcoStation

Water will be removed from the aquifer beneath the leach field at the MMR wastewater treatment plant.

Our concept is to build an ecological treatment station at this site to manage residual perchlorates in the wastewater and to use the remnant nitrates in the water to complete the bacterial processes for the removal of perchlorates in the groundwater. Thus, the ecological system will have the twofold benefits of managing perchlorates in the ground water and nitrates.

The concepts to be introduced to the site include a series of symbiotically linked technologies all of which can be utilized on site to remediate the ground or wastewater but also serve as an available tool to the surrounding communities to provide materials for storm, ground, and sewer remediation projects. It is also our goal to demonstrate conservation design practices on site for the management of stormwater.

Eco-Machine

Water will be pumped to the site at a rate of 10,000 GPD. The Eco-Machine greenhouse is 3500 ft^2 and intended to house both the Eco-Machine tanks and indoor fermenters and infrastructure for the Injection BioReactor (IBR).

The first tank(s) in the Eco-Machine sequence will be either one 5,000 or two 2,500 gallon tanks. The intention of these pretreatment tanks is to provide operational flexibility to either operate as anoxic chambers for denitrification or a scrubber as a contingency to encountering residual chlorines. An additional hydraulic capacity of 10,000 gallons will be the next in the treatment sequence. This volume allows for the Eco-Machine to have the required retention times as a stand alone system in the presence of nitrifying bacteria or to accelerate the pump through rates while working in tandem with the Hydros IBR (injection batch reactor). The series of tanks will be planted and capable of being aerated if necessary. The root systems of the plants will act as a habitat /media for the bacteria.

Loading for bear ecological design:

- Eco-Machine treatment systems
- Bacterial fermentation and distribution systems

- Ø Mycelium incubation and distribution
- Ø Conservation design practices applied to EcoStation site

The Eco-Machine is an ecological aquatic technology developed by Dr. John Todd. By mimicking and utilizing natural ecosystems, the Eco-Machine is capable of treating impaired water without the use of chemicals and with minimal energy consumption. Eco-Machines have been used to clean many types of impaired waters, from municipal wastewater to the carcinogen-laden waters of Chattanooga Creek. Todd Ecological has installed all sizes of Eco-Machines around the world, such as a 2,000 GPD system for NASA, to a system in Fuzhou, China designed to treat over 1 million GPD. Our research has shown that the Eco-Machine can be directly facultative for the reduction of perchlorates and nitrates. The presence of adequate bacteria and retention times are required for the reduction of perchlorates. In addition to the Eco-Machine's capacity to treat the contaminants, an Eco-Machine can further provide ideal habitat for the bacterial communities that can then be integrated into groundwater sources via laterals and wells as proposed in the following section.

In addition to providing retention time and the capacity to inoculate drawn up water with appropriate bacteria, the Eco-Machine may also provide perchlorate treatment through phytoremediation. Plant sequestration of perchlorate has been shown in species of tobacco and poplar, potential candidates for aquatic cell plantings. (Newman and Reynolds, 2004) Phytoremediation will also be incorporated into the sustainable landscape design.

Bacterial Fermentation and Inoculation

A major point of technology integration in this proposal is distributing nutrients and bacteria through the layered Eco-Machine media where concentrated liquid solutions of microorganisms and associated enzymes and nutrients are present. The use of concentrated enzymes and microorganisms being fed into the Eco-Machine substantially strengthens the restoration process with respect to the prior technique, which utilizes no continuous enzymatic, and bacterial feeds. Use of liquid enzymes, bacteria, and micronutrients through separate feed pipelines further expands the impact for perchlorate and nitrogen reduction and allows the enzyme and bacterial growth to proceed much more rapidly at the start and with much greater uniformity and predictability. The liquid microorganism feeds can be continually dispersed throughout the mass being treated. A rapid and effective dispersion of the fluidized bacteria across the axis of the leachate treatment area allows for both point augmentation and biomass growth throughout the sand mass, rather than having some areas, close to a solid feed container, having over stimulated growth and other areas, at some distance from the solid container, being essentially starved for microorganisms.

Hydros Remediation has developed patent pending in situ microbial injection techniques that are currently being used in applications relating to microbial gas augmentation and remediation. Hydros proposes integrating the enzyme and bacteria technology in combination with the Eco-Machine system to restore ground water with perchlorate and nitrogen contamination on the MMR.

Hydros will provide:

1. Perchlorate reducing bacteria grown in large volume fermentation tanks.

2. HydroCarb, a carbon source for perchlorate and nitrate conversion and removal. Removal is by the selected bacteria using carbon as an electron donor. This is similar to denitrification.
3. Distribution array to pump treated and restored water back into the leachate entrainment area.

Proposed Process Design

Hydros proposes building on the initial process system and scaling it to build a microbial shield across the width of the impact region. Samples from the sediment types in the area all show rapid percolation characteristics of >36 meters per day when adequate moisture is present. The water table depth in the region is ~65 feet and the overlaying sand has a greater than 35% moisture content.

The project will include the installation of a semi permanent liquid injection system and a 3000-gallon fermentation holding-tank to add both bacteria and nutrients to a subsurface distribution pipeline that runs down the central axis of the treatment area. The biological growth process will utilize bacteria species that have been shown to degrade perchlorate and have shown no detectable effects on ground water flow patterns and fluid movement. The microbial injection will be coupled with nutrient management and is designed to reduce the perchlorate. This system is flexible, easy to maintain, and can be modified to redirect bacteria and nutrients to anywhere within the zone of contamination.

Previous studies have shown that adequate moisture and specific nutrients are required for bacteria growth in situ treatments. To build a bacterial "curtain," the bacterial injection system will be used to dispense water and nutrients below the surface and at depth. Data from groundwater analysis from a nearby Bourne, Massachusetts landfill project has shown bacterial additions can be supplied at a minimum of 5-7 days. For planning purposes, it is anticipated that one (1) grow out and addition per week will be used. The proposed sequence is to add water, followed by nutrients and then bacteria in a cycling sequence. The system can be drained after each use since the pipes will run over the berm and flow to each side to drain. The nutrients will be adjusted to provide a minimal growth matrix with perchlorate acting as the main energy source. The actively growing cells and carbon source will be streamed through the Eco-Machine. The Eco-Machine will maintain nitrification and denitrification, supplemented by the carbon and bacterial injections from the IBR.

The proposal utilizes equipment currently in place and builds a bacterial growth and distribution point near the flare area. The area will have security, water, and power and the space required is minimal. The growth and distribution tank will be located near the flare for heat. Bacteria will be grown in a two-stage fermentation process where small batches will be used to inoculate 1000 gallons of complex media. Upon reaching cells counts of greater than 10^9 per ml, the bacteria will be pumped into the Eco-Machine and outgoing treated flow. Following the bacterial injection, nutrients will be blended and pumped over the hill to the distribution area to help "force" bacteria, nutrients, and water into the contaminated field. Lastly, water will be flushed through the system to further "push" the bacteria and nutrients deeper into the zone and clean the lines.

Suitable microorganism field projects include those that have the ability to do one or more of the

following: to inhibit desulfuration of decaying organic material; to aid assimilative sulfate reduction to oxidize hydrogen sulfide to convert ammonia to nitrite and nitrate; reduce biological oxygen demand; degrade fat, oil and/or grease contamination; degrade petroleum products and by-products, chemical contaminants such as volatile organic compounds, semi-volatile organic compounds, insecticides, pesticides, polychlorinated biphenyls and dioxins, provide suppression or water detoxification, solids degradation; or any combination thereof. As examples, exemplary microorganisms include: (1) Nitritifiers (convert to Nitrite): Nitrosomonas europaea, Nitrospira briensi, Nitrosococcus nitrosus, Nitrosococcus oceanus and Nitrosolobus multiformis; (2) Nitrafiers (convert to Nitrate) Nitrobacter winogradsky, Nitrospina gracilis and Nitrococcus mobilis.

Conservation Design Strategies for the EcoStation Site

Role of Conservation Design Forum

As part of our ecological goal of responsible water management, we are including in this proposal the Conservation design Forum (CDF) to ensure that stormwater and run-off from the area does not further impair the site. CDF, a nationally recognized organization, will bring additional expertise to the team in the form of hydraulic engineers, landscape architects, and botanists with a focus on sustainable landscape management. A thorough topographical and hydrological site assessment and planning approach that preserves existing natural areas and utilizes naturalized drainage and detention measures for stormwater management will be undertaken. The site that we will use to restore the groundwater will be managed in this responsible approach. It is intended that bioswales, vegetated swale systems designed to retain and temporarily store and treat runoff will be installed. These bioswales will be planted with native vegetation and mycelium to enhance filtration and cleansing of the water in order to improve the water quality before it enters the canal and the groundwater. JTED and CDF intend to apply these natural water management strategies to the site adjacent to the Cape Cod Canal; it is intended that a buffer of native vegetation along the canal will be adopted to mitigate the introduction of contaminates and high nutrients and improve water quality and provide natural habitat benefits. Plantings for phytoremediation will also be integrated into the landscape.

JTED also recognizes that there are other issues in addition the perchlorate challenges within the aquifer as the RFR addresses. Soil based perchlorates, while minimal in the sandy soils, nitrogen in our saltwater estuaries that has been devastating to our eel grass communities, and phosphorous which has been a factor in the continued degradation of our freshwater ponds are all components of the whole problem. By adopting an ecological approach to the whole problem, we believe that we can successfully restore the natural resources to their baseline state. Our collaborative process results in the enduring qualities of beauty, authenticity, and community, and serve to reconnect people to their place and each other by integrating a living environment into every place where we live and learn, work and play.

Permitting

At the current stage, no permitting is required to implement greenhouse based system assuming it will be on MMR land, in close proximity to an existing monitoring well. Additional permitting will

be delineated by MMR as the agency overseeing the project.

Property Access

As of deadline for this proposal, property access has not been explored. The design team intends to work with MMR and EEA to acquire permissions for vehicle, personnel, and equipment access to proposed site location. Consent to dig distribution and monitoring wells and lateral lines will be addressed with regulatory oversight.

Environmental, Social & Economic Impacts

There are numerous beneficial impacts to using a local, ecologically friendly solution to treat the water at MMR. This proposal was designed with the idea of creating an ecological station that can be spun out and duplicated throughout communities on Cape Cod with room for expansions of additional eco technologies such as myco-production and distribution.

Mycelial Restoration

Another tool that will be added and implemented in order to enhance the water treatment would be the inclusion of a mycoremediation cell. Mycoremediation is a form of bioremediation that uses fungi and mycelium to degrade and remove toxins from the environment. The mycelium secretes enzymes that typically break down lignin and cellulose, the main components of plant fibers. It has been shown that this process can also be applied to effectively degrade aromatic pollutants and chlorinated compounds. Mycologist Paul Stamets has done research indicating that mycelium is effective at breaking down petroleum hydrocarbons and industrial toxins. An inoculation cell will be established at MMR. A fraction of the flows will be distributed through the "myco-cell" and reintroduced to the Eco-Machine. The mycelium production lab has not been included in this budget, but is intended for the expanded scope or Phase II of this project. The line item shown on the budget and intended for use in the proposed 24-month implementation is to purchase mycelia spawn. The "myco cells" secrete beneficial enzymes and produce spore. On a scheduled basis these will be introduced to the sustainable landscape feature to enhance the overall efficacy of the bio-swales and rain gardens as well as supplement the over soil and myco rhizal health.

As part of a responsible and sustainable restorative process for this project, JTED intends to employ renewable energy systems for our site power requirements. We are all keenly aware of the problems facing MA from oil dependency and the effects of climate change on our waters and land. With an expected requirement of approximately one to three kilowatts of power needed to operate the pump, blower, and ancillary equipment, the responsible use of solar and wind power will supply our needs. The

potential for methane conversion from the nearby landfill for heating potential in the colder MA months is also a great potential. Our targeted focus, to restore the ipmpaired waters of the Cape Cod aquifer can be met via our Eco-Machine system without adding to other environmental problems of the world and our community.

Many of these systems have been developed into education facilities. These can be highly interactive, with transparent technologies and operation that can provide a dynamic educational environment. It can serve as a model of natural technologies for grade school through graduate students.

The EcoStation can set the local precedent for sustainable site landscaping. Furthermore, it could serve as an incubator/nursery for local communities and businesses, and set an example for other local restoration sites. This could establish a system that, with further funding, would support viable restoration efforts for water and soil contaminants throughout Cape Cod.

The majority of theses technologies are open source and collaborative, and the EcoStation group welcomes collaboration with other groups that have common goals.

Long Term Effectiveness

The EcoStation is neither chemically or mechanically intensive, thus creating a small footprint for the entire system. Hydros will be incorporating IBR technologies that will further reduce the footprint of the EcoStation. Each module and component has been designed for potential mobility and variable site location. Conservation design principles were considered through the planning of the EcoStation. As a result, it has been designed to allow little to no stormwater to exit the site.

The EcoStation is particularly effective due to its high impact on a per gallon extraction basis. The combination of in situ treatment and bacteria delivery systems to treat the water in the aquifer exponentially decrease the cost per gallon of water treated.

The regular testing of perchlorates and nitrogen will confirm the effectiveness of this treatment. This lab work is included in the budget.

Laterals in wells are easily installed and relatively inexpensve, relatively adaptive to future planning. The EcoStation and IBR can continue to provide or be expanded to provide hydrological assessment and stability for the vicinity.

Monitoring and Evaluation Plan

Evaluation and monitoring is critical to the long-term effectiveness of the EcoStation. The design team will work closely with the appropriate regulatory bodies and utilize existing monitoring wells and resources.

Perchlorate Sampling

Subsurface perchlorate samples will be taken in multiple locations and sent to the Barnstable County Health Laboratory for analysis. In addition a quantitative real-time PCR assay targeting the pcrA gene, encoding the catalytic subunit of perchlorate reductase, detected pcrA genes from perchlorate-reducing bacteria in three different genera and from soil microbial communities will be utilized. We will sample partial pcrA sequences which indicate differences in the composition of perchlorate-reducing bacteria following exposure to different electron donors.

The process will take a minimum of 24 months to complete and adequately monitor. Samples will be taken weekly. This should be done in collaboration with the Board of Health (BOH), as it recognized that the BOH has access to several monitoring wells in the immediate vicinity.

The sampling will utilize existing USGS data and information to corroborate the results. The measured quantities will include weekly amount extracted, weekly influent perchlorate and nitrogen levels, weekly discharge flows, periodic chlorine and nitrogen levels, and weekly down-flow well measurements. A wellhead will also periodically be measured to determine the effectiveness of the time-release process of bacterial injection on the groundwater.

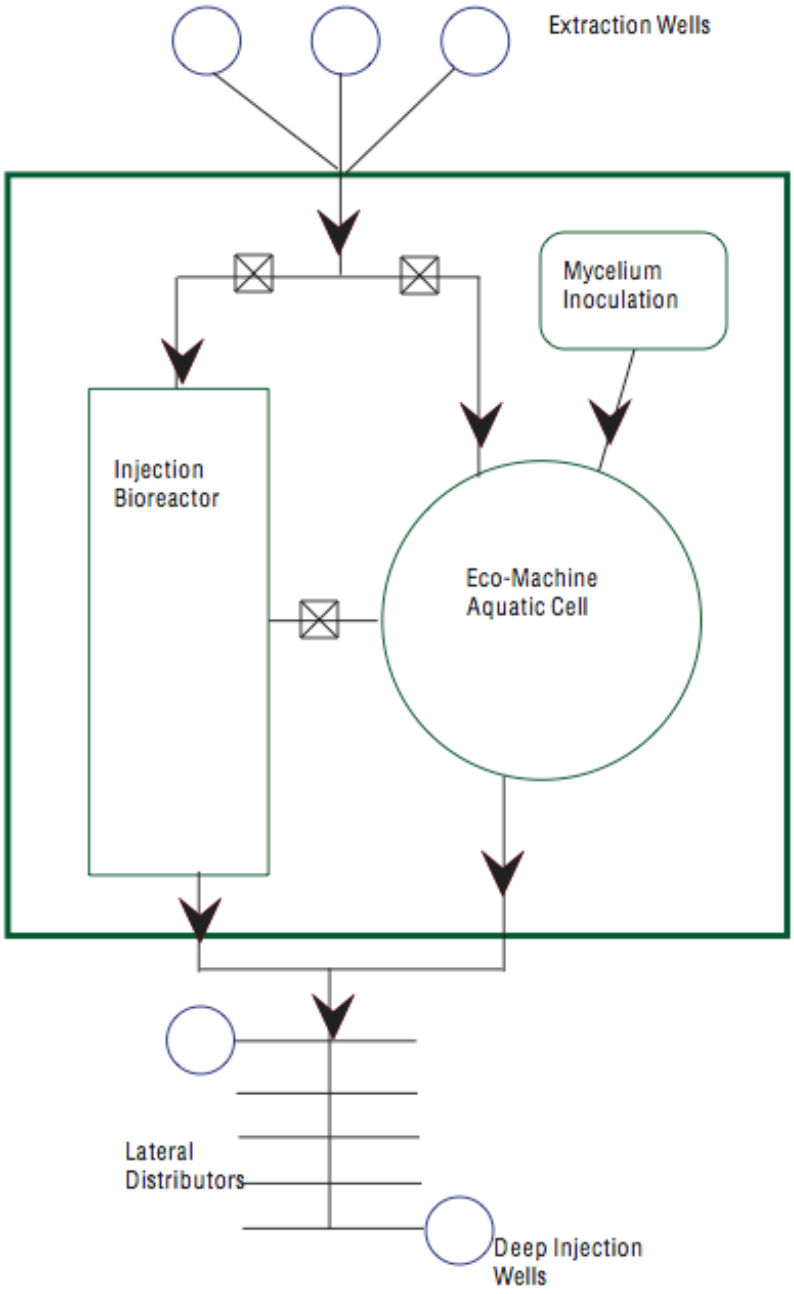
Project Coordination

Hydros is currently performing restoration work at the Bourne Landfill. Some of the infrastructure for the MMR project will be donated in kind from the landfill site.

This project may also be integrated with the UMASS study on microbial application for perchlorates. Testing and compilation of results could be coordinated and implemented by UMASS students and faculty.

The project is intended to be funded by the Massachusetts Executive Office of Energy and Environmental Affairs Natural Resource Damages Trust

Proposed Schematic Process Flow



BUDGETS NARRATIVE FOR JOHN TODD ECOLOGICAL DESIGN

NRD GROUNDWATER RESTORATION PROJECT: TEXTRON / MMR PROJECT

A. Salaries and Wages

1. Principal Investigator, Dr. John Todd- He will be responsible for project management, scientific and biological process calculations and overall design guidelines.
2. Project Director, Jonathan Todd- He will be responsible for overall project management, contract negotiations, subcontractor coordination, and communications with all vested parties.
3. Construction Management, Conor Lally -He will oversee the site installation of the treatment systems as well as assist lead Engineer on detailed design process calculations, materials sourcing and nutrient removal. Conor will also be the site operator for the two year operations period.
4. Engineering, Michael Zavoda, P.E. - He will engineer restorative treatment system including wetland and aquatic tank based Eco-Machine treatment system. He will work with the project manager, project subcontractors and local parties to incorporate systems into the site specific conditions and environment.
5. Administration Support, Kim Sousa - She will be responsible for all administrative coordination, document processing and filing as well as coordinating direct and indirect schedules.
6. CAD Draftsperson, Craig Johnson- He will provide computer / construction drawings and incorporate Eco-Machine with topography of site.

B. Employee / Fringe Benefits

The fringe benefits vary per employee between 19 % and 25% based on overall benefits, holiday and vacation time. An average fringe rate of 22% was used. Total fringe benefits total $37,660 for the two year operations period; John Todd Ecological Design is donating the cost of fringe benefits to this project as an in-kind contribution.

C. Total Salaries, Wages, and Fringe Benefits for total contract period

Total Salaries, Wages and Fringe Benefits Breakdown

Employee	Salary rate	Hours	Total	Fringe - all donated	Total Compensation
Dr. John Todd	$125.00	208	$26,000	$0	$26,000
Jonathan Todd	$46.15	624	$28,800	$0	$28,800
Conor Lally	$26.45	1607	$42,500	$0	$42,500
Michael Zavoda	$36.06	624	$22,500	$0	$22,500
Kim Sousa	$23.08	312	$7,200	$0	$7,200
Craig Johnson	$28.85	208	$6,000	$0	$6,000
Total				$0	$133,000

D. Contracted Services

The contractual services will be for construction of a restorative treatment system for the perchlorate contaminated aquifer below the 22,000 acre Massachusetts Military Reserve. A total of two years operations that includes an operator and monthly testing are also a component of this proposal.

Conservation Design Forum, a nationally recognized landscape and stormwater management organization will be brought onto the team to coordinate the site management of controlling stormwater and nutrient runoff within our intended treatment area. Over a two year period CFD services will be $30,000

Fungi Perfecti and Paul Stamets will be brought onto the team to assist in the soil remediation and facilitate the treatment process with mycelium production and inoculation within the affected area. Over a two year period Fungi Perfecti services will be $25,000.

Hydros and Dr. Steve Boyd will be brought onto the team as microbiologists with a specific bacteria strain proven to breakdown perchlorates. Dr. Boyd is currently working on the Borne landfill and has gained valuable insight to the specific issues of the contaminated groundwater. Hydros two year labor and materials / biological supplies will be $231,000

Barnstable County Board of Health and Environment will be used over the two year period to perform regular independent tests on the influent and effluent water into and from the Eco-Machine. A two year allocation of $32,000 has been budgeted.

E. Supplies, Materials and Equipment

The primary materials cost will be the 3,500 square foot greenhouse structure at $52,500; earthworks needed to excavate for the greenhouse structure, sand filter and placement of Hydros and Eco-Machine tanks is $25,000. An allocation of $37,000 is made for installing a renewable power source, potentially a combination of solar and wind turbines to produce the expected 3 kilowatts of power needed. The Eco-Machine tanks, piping, aeration equipment, sand filter and racks are budgeted at $64,500 with a two year allocation of $20,000 for biological and other consumables replacement. $12,500 has been budgeted for laboratory supplies over the two year period, and a budget of $1,000 for office supplies and communication is also allocated.

F. Travel Expenses

Travel for staff to and from the main office in Woods Hole, MA to the site in Bourne, MA as well as expected meetings with officials and vested community members is budgeted at $2,700.

G. Total Project costs

Total costs for the construction and two years operations for the system totals $695,460. JTED is contributing a high quality microscope from our office as well as the cost for all JTED staff benefits to this project totaling $30,460. Therefore the total project cost is $665,000.

SUMMARY, YEAR 1 - 2 PROJECT / OPERATIONS BUDGET

PERSONNEL (Applicant Organization Only)

Name	Project Role	% Time	Salary Requested	Fringe Benefits	Total Cost	In-Kind	NCDP Cost
Dr. John Todd	Principal Investigator		$ 26,000	$ 5,720	$ 31,720	$ 5,720	$ 26,000
Jonathan Todd	Project Manager		$ 28,800	$ 6,336	$ 35,136	$ 6,336	$ 28,800
Conor Lally	Construction / Operations		$ 42,500	$ 9,350	$ 51,850	$ 9,350	$ 42,500
Michael Zavoda	Engineering		$ 22,500	$ 4,950	$ 27,450	$ 4,950	$ 22,500
Kim Sousa	Administrative Services		$ 7,200	$ 1,584	$ 8,784	$ 1,584	$ 7,200
Craig Johnson	CAD Drafting		$ 6,000	$ 1,320	$ 7,320	$ 1,320	$ 6,000
	Subtotal:		$ 133,000	$ 29,260	$ 162,260	$ 29,260	$ 133,000
TOTAL PERSONNEL COSTS:					$ 162,260	$ 29,260	$ 133,000

OTHER DIRECT COSTS		Total Cost	In-Kind	NCDP Cost
EQUIPMENT (Use additional pages for itemization if necessary)				
Greenhouse, 3500 sq ft		$ 52,500	$ -	$ 52,500
Renewable Power System		$ 37,000	$ -	$ 37,000
Eco-Machine Tanks & equipment, 2,000 gallons each		$ 37,500	$ -	$ 37,500
Aeration / Plumbing & Sand Filter		$ 27,000	$ -	$ 27,000
Earthwork		$ 25,000	$ -	$ 25,000
Hydros Equipment		$ 75,000	$ -	$ 75,000
	Subtotal :	$ 254,000	$ -	$ 254,000
SUPPLIES (Use additional pages for itemization if necessary)				
Laboratory supplies		$ 12,500	$ 1,200	$ 11,300
Independent certified lab / sampling		$ 32,000	$ -	$ 32,000
Biologicals / Plants		$ 20,000	$ -	$ 20,000
Office supplies		$ 1,000	$ -	$ 1,000
	Subtotal :	$ 65,500	$ 1,200	$ 64,300
TRAVEL				
Travel from WH to Bourne				
	Subtotal :	$ 2,700	$ -	$ 2,700
SUBCONTRACTS				
Conservation Design Forum				
David Yocca, Director of Landscape Planning				
Landscape and rainwater management				
Elmhurst, IL	**Subtotal :**	$ 30,000	$ -	$ 30,000
Fungi Perfecti				
Paul Stammets, President				
Mycellium Production				
Olympia, WA	**Subtotal :**	$ 25,000	$ -	$ 25,000
Hydros Remediation				
Steve Boyd, President				
Microbial Production and Injection				
Falmouth, MA	**Subtotal :**	$ 156,000	$ -	$ 156,000
TOTAL TWO YEAR CAPITAL & OPERATIONS COST:		$ 695,460	$ 30,460	$ 665,000

FIRST YEAR PROJECT BUDGET

PERSONNEL (Applicant Organization Only)

Name	Project Role	% Time	Salary Requested	Fringe Benefits	Total Cost	In-Kind	NCDP Cost
Dr. John Todd	Principal Investigator	10%	$ 13,000	$ 2,860	$ 15,860	$ 2,860	$ 13,000
Jonathan Todd	Project Manager	20%	$ 19,200	$ 4,224	$ 23,424	$ 4,224	$ 19,200
Conor Lally	Construction / Operations	55%	$ 27,500	$ 6,050	$ 33,550	$ 6,050	$ 27,500
Michael Zavoda	Engineering	25%	$ 18,750	$ 4,125	$ 22,875	$ 4,125	$ 18,750
Kim Sousa	Administrative Services	10%	$ 4,800	$ 1,056	$ 5,856	$ 1,056	$ 4,800
Craig Johnson	CAD Drafting	10%	$ 6,000	$ 1,320	$ 7,320	$ 1,320	$ 6,000
	Subtotal:		$ 89,250	$ 19,635	$ 108,885	$ 19,635	$ 89,250

TOTAL PERSONNEL COSTS: $ 108,885 $ 19,635 $ 89,250

FIRST YEAR PROJECT BUDGET

OTHER DIRECT COSTS		Total Cost	In-Kind	NCDP Cost
EQUIPMENT (Use additional pages for itemization if necessary)				
Greenhouse, 3500 sq ft		$ 52,500	$ -	$ 52,500
Renewable Power System		$ 27,000	$ -	$ 27,000
Eco-Machine Tanks & equipment, 2,000 gallons each		$ 37,500	$ -	$ 37,500
Aeration / Plumbing & Sand Filter		$ 27,000	$ -	$ 27,000
Earthwork		$ 25,000	$ -	$ 25,000
Hydros Equipment		$ 30,000	$ -	$ 30,000
	Subtotal :	$ 199,000	$ -	$ 199,000
SUPPLIES (Use additional pages for itemization if necessary)				
Laboratory supplies		$ 7,500	$ 1,200	$ 6,300
Independent certified lab		$ 17,000	$ -	$ 17,000
Biologicals / Plants		$ 10,000	$ -	$ 10,000
Office supplies		$ 500	$ -	$ 500
	Subtotal :	$ 35,000	$ 1,200	$ 33,800
TRAVEL				
Travel from WH to Bourne				
	Subtotal :	$ 1,500	$ -	$ 1,500
SUBCONTRACTS				
Conservation Design Forum David Yocca, Director of Landscape Planning Landscape and rainwater management Elmhurst, IL	**Subtotal :**	$ 25,000	$ -	$ 25,000
Fungi Perfecti Paul Stammets, President Mycellium Production Olympia, WA	**Subtotal :**	$ 12,500	$ -	$ 12,500
Hydros Remediation Steve Boyd, President Microbial Production and Injection Falmouth, MA	**Subtotal :**	$ 86,000	$ -	$ 86,000

TOTAL FIRST YEAR COST: $ 467,885 $ 20,835 $ 447,050

SECOND YEAR PROJECT BUDGET

PERSONNEL (Applicant Organization Only)

Name	Project Role	% Time	Salary Requested	Fringe Benefits	Total Cost	In-Kind	NCDP Cost
Dr. John Todd	Principal Investigator	10%	$ 13,000	$ 2,860	$ 15,860	$ 2,860	$ 13,000
Jonathan Todd	Project Manager	10%	$ 9,600	$ 2,112	$ 11,712	$ 2,112	$ 9,600
Conor Lally	Construction / Operations	30%	$ 15,000	$ 3,300	$ 18,300	$ 3,300	$ 15,000
Michael Zavoda	Engineering	5%	$ 3,750	$ 825	$ 4,575	$ 825	$ 3,750
Kim Sousa	Administrative Services	5%	$ 2,400	$ 528	$ 2,928	$ 528	$ 2,400
Craig Johnson	CAD Drafting	0%	$ -	$ -	$ -	$ -	$ -
	Subtotal:		$ 43,750	$ 9,625	$ 53,375	$ 9,625	$ 43,750
TOTAL PERSONNEL COSTS:					$ 53,375	$ 9,625	$ 43,750

OTHER DIRECT COSTS		Total Cost	In-Kind	NCDP Cost
EQUIPMENT (Use additional pages for itemization if necessary)				
Greenhouse, 3500 sq ft		$ -	$ -	$ -
Renewable Power System		$ 10,000	$ -	$ 10,000
Eco-Machine Tanks & equipment, 2,000 gallons each		$ -	$ -	$ -
Aeration / Plumbing & Sand Filter		$ -	$ -	$ -
Earthwork		$ -	$ -	$ -
Hydros Equipment		$ 45,000	$ -	$ 45,000
	Subtotal :	$ 55,000	$ -	$ 55,000
SUPPLIES (Use additional pages for itemization if necessary)				
Laboratory supplies		$ 5,000	$ -	$ 5,000
Independent certified lab		$ 15,000	$ -	$ 15,000
Biologicals / Plants		$ 10,000	$ -	$ 10,000
Office supplies		$ 500	$ -	$ 500
	Subtotal :	$ 30,500	$ -	$ 30,500
TRAVEL				
Travel from WH to Bourne				
	Subtotal :	$ 1,200	$ -	$ 1,200
SUBCONTRACTS				
Conservation Design Forum David Yocca, Director of Landscape Planning Landscape and rainwater management Elmhurst, IL	**Subtotal :**	$ 5,000	$ -	$ 5,000
Fungi Perfecti Paul Stammets, President Mycellium Production Olympia, WA	**Subtotal :**	$ 12,500	$ -	$ 12,500
Hydros Remediation Steve Boyd, President Microbial Production and Injection Falmouth, MA	**Subtotal :**	$ 70,000	$ -	$ 70,000
TOTAL SECOND YEAR COST:		$ 227,575	$ 9,625	$ 217,950

Natural Resource Damages Fund
Groundwater Restoration Projects
Textron Systems Corporation/Mass Military Reservation Superfund Site

Project Proposal Form

APPLICANT AND PROJECT INFORMATION.

Type of Entity Check the box that best describes the applicant.

[ ] Private individual
[ ] Non-profit organization
[ ] State government
[ ] Federal government
[ ] Tribal government
[ ] Municipal government
[X] Corporation or Business
[ ] County government
[ ] Academic Institution
[ ] Other (explain)

Authorized Representative of Applicant

Jonathan Todd
Name

President
Title

P.O. Box 497
Address

1 School Street
Address

Woods Hole MA 02543
City State Zip

Phone: (508) 548-2545

Email: jonathan@toddecological.com

Contact Person (if different)

Name

Title

Address

Address

City State Zip

Phone:

Email:

Project Name Provide a brief working name:

Textron / Mass Military Reservation NRD Case Settlement
John Todd Ecological Design proposal for bio-restoration of contaminated site

Project Location

Attach an 8.5 x 11-inch map or copy of an aerial photograph showing project location and extent. Include pertinent topographic and geographic information, a scale, and north arrow.

State(s), Municipality/ies: MA, Sandwich, Bourne, Falmouth & Mashpee

Restoration Priority Categories

Check all relevant boxes.

[X] Protect quality of current drinking water supply
[ ] Protect quantity of current drinking water supply
[X] Protect quality of potential drinking water supply
[ ] Protect quantity of potential drinking water supply
[ ] Offset to mitigate impacts to water-dependent ecosystems

List Specific Injured Natural Resources and/or Impaired Natural Resource Services to Benefit from Project

The communities of Sandwich, Bourne, Falmouth and Mashpee Massachusetts groundwater; this injured natural resource is the result of the perchlorate release from or at the J Ranges at the Massachusetts Military Reservation.

Project Type Check all relevant boxes.

[X] Aquifer protection
[ ] Aquifer recharge
[ ] Protection of environmentally sensitive lands or critical habitats
[ ] Water conservation
[X] Integrated water and wastewater management

TEXTRON/MMR NRD FUNDING ALLOCATION BY FISCAL YEARS [1]

PROJECT TITLE:	**Eco-Machine for restoration of injured aquifer**						
APPLICANT NAME:	**John Todd Ecological Design**						
EXPENSE CATEGORY	**FISCAL YEAR 1**		**FISCAL YEAR 2**		**FISCAL YEAR 3**		**FISCAL YEAR 4**	
	Textron/MMR NRD Funds		**Textron/MMR NRD Funds**		**Textron/MMR NRD Funds**		**Textron/MMR NRD Funds**	
A. SALARIES	$89,250		$43,750					
B. EMPLOYEE BENEFITS - in-kind contribution by JTED	$0		$0					
C. CONTRACTED SERVICES	$123,500		$87,500					
D. SUPPLIES, MATERIALS AND EQUIPMENT	$232,800		$85,500					
E. TRAVEL	$1,500		$1,200					
F. OTHER (LIST)								
G. OTHER (LIST)								
TOTAL BY FISCAL YEAR	**1**	$447,050	**2**	$217,950	**3**		**4**	
GRAND TOTAL (sum of boxes 1+2+3+4) [This sum is the total NRD fund request]	$665,000							

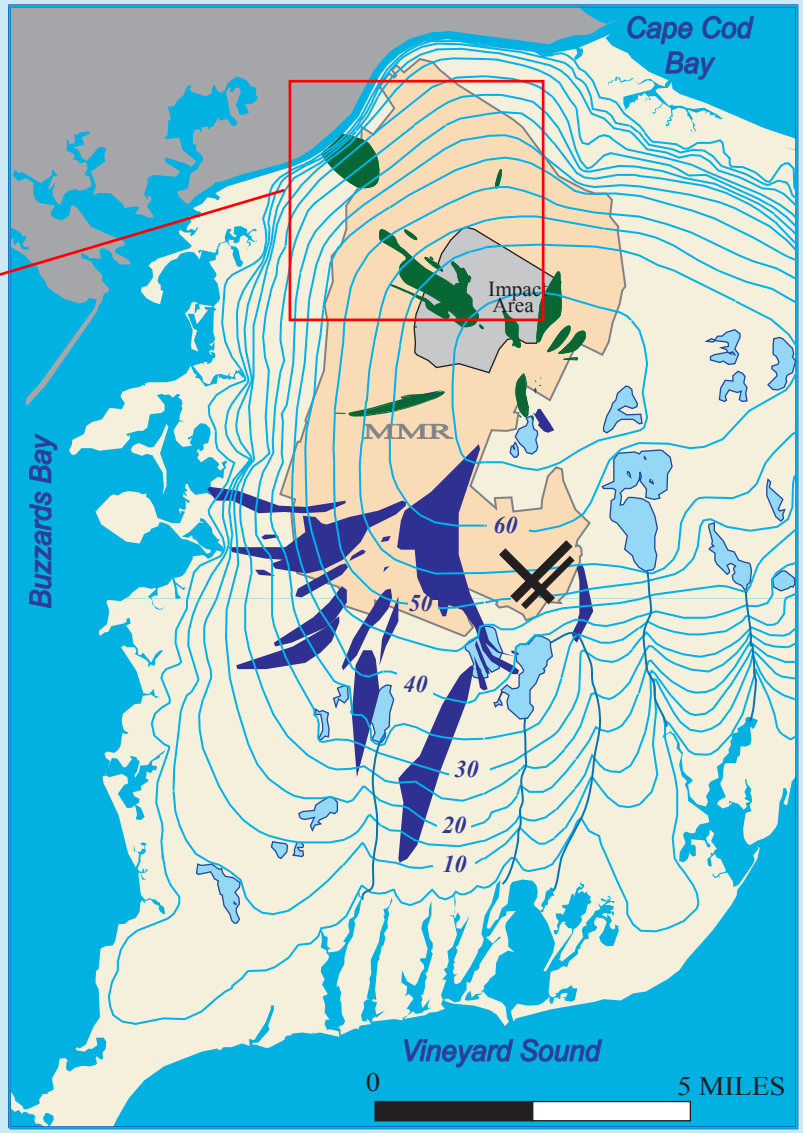
[1] The fiscal year is July 1 – June 30. If the proposed project will be completed in one year, fill in only the column titled "Fiscal Year 1."

TEXTRON/MMR NRD PROJECT BUDGET SUMMARY BY TASK AND FUNDING SOURCE

PROJECT TITLE:	**Eco-Machine for restoration of injured aquifer**							
APPLICANT NAME:	**John Todd Ecological Design**							
TASK[2]	**TEXTRON/MMR NRD FUNDS**		**OTHER CONTRIBUTIONS**				**TOTAL COST BY TASK**	
			COMMITTED -in kind contribution		**NOT COMMITTED**			
A. Design, Install, 1 Year Operations Eco-Machine	$447,050		$20,835				$467,885	
B. Operations, year 2 of Eco-Machine	$217,950		$9,625				$227,575	
C.								
D.								
E.								
F.								
G.								
TOTAL BY FUNDING SOURCE	**5**	$665,000	**6**	$30,460	**7**		**8**	**GRAND TOTAL** $695,460

[2] The listed tasks should correspond with information provided in the Project Narrative.

Proposed
EcoStation Site



Ground-water contaminant plumes at and near the Massachusetts Military Reservation in February 2005. The green plumes are composed primarily of explosive compounds and perchlorate. The blue plumes are composed primarily of chlorinated solvents and ethylene dibromide. The water-table contours are shown in feet above sea level. Source of information: Air Force Center for Environmental Excellence Installation and Army

(USGS, 2007)

John **TODD ECOLOGICAL** Design, Inc.

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508.548.2545 508.540.3962 fax TODDECOLOGICAL.COM

John Todd
Chief Scientist, John Todd Ecological Design
1 School Street
Woods Hole, MA USA 02543
&
Research Professor & Distinguished Lecturer
The University of Vermont

EDUCATION

The University of Michigan, Ph.D., Fisheries/Oceanography 1968
McGill University, M.Sc. Parasitology/Tropical Medicine 1963
McGill University, B.Sc. Agriculture 1961

PROFESSIONAL

1999 to present	Research Professor & Distinguished Lecturer The University of Vermont
1989 to present	Chairman, Principal and Chief Scientist, John Todd Ecological Design
1981 to present	President, Ocean Arks International
1997-1999	Visiting Professor, The University of Vermont
1970- 1974	Assistant Scientist, The Woods Hole Oceanographic Institution
1969-1980	President, The New Alchemy Institute
1968-70	Assistant Professor, San Diego State University

PROFESSIONAL AND HONORARY MEMBERSHIPS

The Lindisfarne Association
Society of Ecological Restoration
Advisory Board, Ecological Engineering, The Journal of Ecotechnology

HONORS

2008	Winner Buckminister Fuller Challenge Award
2006	Global Visionary Award, City of Chicago
2002	Named one of thirty-five top Inventors of the 20th Century by Lemelson-MIT Program, Inventing Modern America
2000	Honorary Doctorate, Green Mountain College
1998	Bioneers' Life Time Achievement Award
1998	Charles & Anne Morrow Lindbergh Award
1996	Honorary Doctorate in Engineering, McMaster, University
1996	Environmental Merit Award, The US EPA
1994	Chrylser Award for Innovation in Design
1991	Discover Award for Technological Innovation
1990	Teddy Roosevelt Conservation Award, Pres. Bush
1990	United Nations (FUNEP) Recognition for Contributions to the Global Environment
1989	Chico Mendes Memorial Award, US EPA
1980	Threshold Award for Contributions to Human Knowledge
1968	Horace H. Rackham Award, Univ. of Mich. for Outstanding Ph.D. Thesis

Dr. Todd is one of the pioneers in the emerging field of ecological design and engineering. He has degrees in agriculture (McGill University), parasitology & tropical medicine (McGill University) and a doctorate in fisheries and ethology from the University of Michigan. He has received two honorary doctorates in science and engineering respectively. John Todd teaches ecological design and oversees

an ecological design studio at UVM. As founder and Chairman of John Todd Ecological Design Dr. Todd incorporates his real world application with the educational environment, benefiting clients and students alike.

Dr. Todd is the author of over two hundred scientific, technical and popular articles. He is the author of seven books, the latest with his wife Nancy Jack Todd, entitled “From Eco-cities to Living Machines: Ecology as the Basis for Design”. He is the inventor of Eco-Machines for the treatment of wastes, production of foods, generation of fuels and the restoration of damaged aquatic environments. He holds four patents, and was named one of the 20th Century’s top thirty-five inventors by the Lemelson-MIT Program for Invention and Innovation, in their 2002 book entitled “Inventing Modern America: from the Microwave to the Mouse”(MIT Press).

BOOKS PUBLISHED

1994: From Eco Cities to Living Machines: Ecology as the Basis of Design, North Atlantic Press, Berkeley (with Nancy Jack Todd)

1984: Bioshelters, Ocean Arks, City Farming: Ecology as The Basis of Design; Sierra Club Books, San Francisco (with Nancy Jack Todd)

1981: Reinhabiting Cities and Towns. Planet Drum Press, San Francisco.

1980: The Village as Solar Ecology. New Alchemy Books, Falmouth, MA (with Nancy Jack Todd)

1980: Tomorrow is Our Permanent Address: The Search for an Ecological Design Science as Embodied in Bioshelters. Harper & Row, New York (with Nancy Jack Todd).

1971: The Everlasting Universe, D.C. Heath, Lexington.MA (with Lorne Forstner).

1970: The Everlasting Universe, Heath, Boston, MA (with Lorne Forstner).

John **TODD ECOLOGICAL** Design, Inc.

P.O. BOX 497 / 1 SCHOOL STREET WOODS HOLE, MA 02543
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Jonathan Todd
President, John Todd Ecological Design, Inc.
1 School Street
Woods Hole, MA 02543

Jonathan Todd is the President of John Todd Ecological Design Inc., a leading firm in the development of ecological technologies for food production, waste purification and conversion, environmental restoration and systems integration for architecture and eco-industrial parks.

Jonathan has been immersed in the world of sustainable design practically from birth. As a child and teenager he was educated at the applied ecology think/do tank, the New Alchemy Institute. A seasoned captain, Jonathan holds a profound love of the sea, a bone-deep desire to protect the world's water, and a rare ability to lead, both on and off the deck.

Experience

President, John Todd Ecological Design, Inc. (JTED) 2001/Present
Restructured JTED to be an independent collaborative designs solution company.
Constructed Tyson, the largest restorer Eco-machine at the time.
Continues to push innovation and invention in the field of ecological design.

Project Manager and Consultant, Iasis Corporation 1999/ 2000
Helped the company establish a waste water business in the American South West.
Built prototypes and developed the company's operational technology.

Project Manager, John Todd Ecological Design, Inc. 1995/1999
Designed, fabricated and operated a wide variety of living machines and floating restorer technologies for clients in Canada, Hawaii, Georgia, New Mexico, Maryland, Massachusetts, and Vermont.

Captain of the RV Aquaria I, Ocean Arks International / Hitches in the Merchant Marines 1989/1995
Developed low-power trawling techniques for the New England fishery.
Wintered in the US Virgin Islands giving environmental guided tours.

Captain/Crewman, Various Vessels 1985/1989
Attended Chapman School of seamanship: Stuart, FL.
Attended the College of the Atlantic: Bar Harbor, ME.
Passed examine for USCG captains license for power, sail auxiliary, freight, and towing.
Worked tug and salvage operations for Woods Hole Towing, Titan Salvage, Farrell Marine, Witte Heavy Lift, Eklof Marine, and Packard Marine.

Designer, Researcher, and Captain, Ocean Arks International (OAI) 1981/1985
Assisted in the development of a prototype Ocean Ark, an advanced design sailing vessel tested in Southern New England.
The Ocean Ark was a groundbreaking concept in the fields of environmental restoration and humanitarian aid.
Captain: RV Edith Muma Georgetown, Guyana, South America. Developed a by-catch fishery around the Guyanese shrimp boat fleet. The fishery was designed to provide coastal people in need with a means to feed their communities while reducing their dependency on a capricious fossil fuel supply and mitigating the impact of by-catch. The project developed a new class of sail-assisted working craft and was funded by the Canadian International Development Agency.
Captain: RV Edith Muma Puerti Viejo, along the Caribbean coast of Costa Rica. Developed and spread low-impact fishing practices and technology.

John **TODD ECOLOGICAL** Design, Inc.
P.O. BOX 497 / 1 SCHOOL STREET WOODS HOLE, MA 02543
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Steven H. Boyd
President and Founder Hydros, Inc.
Molecular Diagnostics and Microbial Remediation
114 Waterhouse Road
Bourne, MA 02532

Founder and past Director of R/D of Environmental Operating Solutions
Wastewater Treatment Solutions
1 Colonel Drive
Bourne, MA 02532

President and Founder Sonic Plant Care
Ultrasound Application for Aquaculture
2800 7th Ave
Troy, NY 12180

Vice- President and Founder MicroRemediation LLC Bacterial Remediation
114 Waterhouse Road
Bourne, MA 02532

QUALIFICATIONS AND EXPERIENCE
Hydros and it's associated companies has over 25 years of experience in waste modification, gas reclamation and odor control using microbial and chemical processes.

EDUCATION
Graduate: PHD Boston University
Boston, Massachusetts, 1979 Bio-Chemistry

M.S., University of Massachusetts
North Dartmouth, Massachusetts, 1973; Biological Oceanography

Undergraduate: B.S., Rutgers University
New Brunswick, New Jersey, 1971 Environmental Sciences

EXPERIENCE
1992- Present President, Hydros Inc.
114 Waterhouse Road
Bourne, MA 02532
Steven Boyd is co-founder of Hydros Environmental Diagnostic, Inc. Which are manufactures of molecular diagnostic tools and microbial injectors for agriculture, aquaculture and biolocial oceanographic sciences. Responsibilities include Development and licensing of all products, implementation of marketing strategies for Europe, Asia and the United Stated.

2001-2004 Founder President of Research and Development, Environmental Operating Solutions, Inc. Bourne, MA. 02532
EOS is focused on wastewater and sewage remediation.

2003- Present Founder- Vice President of R/D, Sound Plant Care, Inc. Develops waste water and sewage microbiological products.

1987-1992 Research Department Microbial Diagnostics Associates of Cape Cod, Inc.
704 Main Street
Falmouth, MA. 02540

1972-1987 Woods Hole Oceanographic Institution
Dept of Biology, Biochemistry and Mid-Water Plankton Ecology
Woods Hole, MA 02543

Designed and contracted multiple type of deep sea sampling gear including net systems, bottom samplers and video/acoustic samplers.

Presenter at 27 conferences for the American Phytopathological Society, SWANA, American Chemical Society and various trade associations.

DAVID J. YOCCA RLA, AICP, LEED AP

SENIOR PARTNER AND DIRECTOR OF LANDSCAPE ARCHITECTURE AND PLANNING

EDUCATION

Michigan State University
Bachelor of Landscape Architecture, 1985

PROFESSIONAL EXPERIENCE

Conservation Design Forum
Elmhurst, IL, 1997 - present

Yocca Design Studio
St. Charles, IL, 1995-1996

The Lannert Group
St. Charles, IL, 1985-1995

PROFESSIONAL AFFILIATIONS

US Green Building Council, *Member*

Conservation Research Institute, *Board of Directors*

Sustainable Sites Initiative, Hydrology Subcommittee, *Member*

REGISTRATION

Landscape Architect - IL, IN, WI, NY (Limited Practice)
Certified Planner, AICP
LEED Accredited Professional

PUBLICATIONS AND LECTURES

Greenbuild 2008 (USGBC), *"Water-centric Site Design- The Path to More Sustainable Places",* November 19, 2008, Boston, MA

2008 World Planning Day Lecture, Georgia Institute of Technology, November 10, 2008, Atlanta, GA

American Society of Landscape Architects (ASLA) National Convention, *"Advanced Green Roof Design"* and *"The Sustainable Sites Initiative- Hydrology",* October 6-8, 2008, Philadelphia, PA

Iowa Downtown Summit, *"Design for Sustainable Systems",* August 27, 2008, Charles City, IA

American Planning Association, Tuesdays at APA, *"Integrated Ecological Planning and Site Design: Approaching Green Practice",* July 15, 2008, Chicago, IL

Greening the Heartland, *"Water-centric Site Design- The Path to More Sustainable Places",* June 24, 2008, St. Louis, MO

David J. Yocca, RLA, AICP, LEED AP is a registered landscape architect and certified planner motivated principally by the desire to cultivate healthy, sustainable places that inspire the people they serve. With an intimate knowledge of green site design and land development issues, Mr. Yocca's interests center on culturally sustainable patterns of settlement that integrate human-scaled, walkable neighborhoods with locally appropriate, ecologically-based water landscapes. He is encouraged by the potential for both building new and retrofitting existing places with the quality and characteristics that connect people with their community as a way to sustain it for generations that follow.

Mr. Yocca leads the landscape architectural discipline at CDF, and has served a significant leadership role in a wide array of planning and design efforts. He has developed land use master plans for conservation villages and urban neighborhoods, and participated in the visioning, design, entitlement, and implementation process for numerous ecologically-based sites, neighborhoods, and communities located in the Midwest and elsewhere. He is fluent in a wide range of green building and site development strategies, and in his role at CDF, collaborates regularly with similarly aligned design professionals and clients.

He was the principal landscape architect for many of CDF's pioneering, high profile green projects, including the celebrated Chicago City Hall Demonstration Green Roof. He has served as project principal for many of CDF's LEED projects, including the Kresge Foundation Headquarters in Troy, MI; the Lewis and Clark State Office Building in Jefferson City, MO (Platinum); the Queens Botanical Garden Administration Building in Queens, NY; Walsh College in Troy, MI.; and the Wight and Company Headquarters (Certified) in Darien, IL.

Mr. Yocca routinely presents at workshops and conferences on sustainable topics.

RESPECTIVE PROJECTS

Civic
Chicago City Hall Green Roof
Chicago, Illinois

Cultural
Evelyn P. Tyner Interpretive Center
Glenview, Illinois

Peggy Notebaert Nature Museum
Chicago, Illinois

Queens Botanical Garden Master Plan
Queens, New York

Tribal Complex Master Plan, Pokagon Band of Pottawatomi Indians
Dowagiac, Michigan

Ecological Restoration
Fort Sheridan Lakefront Preserve Natural Resources Action Plan
Fort Sheridan, Illinois

Residential Neighborhoods + Mixed Use Villages
Dailey Road Neighborhood, Pokagon Band of Pottawatomi Indians
Dowagiac, Michigan

Coffee Creek Center
Chesterton, Indiana

Parks + Recreation + Leisure
Millennium Park Master Plan Update
Kent County, Michigan

Camp Winding River Camp Equestrian Center
Dearborn, Missouri

Retreat + Spiritual
Deep Lake Lodge Master Plan
Battle Creek, Michigan

Omega Center for Sustainable Living
Rhinebeck, New York

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March 9, 2009

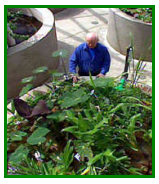
This letter is to confirm that John Todd Ecological Design is contributing the employee cost of fringe and employee benefits to the NRD Groundwater Restoration Project, Textron / MMR. The budgeted contribution for the employee benefits donated is $29,260. In addition to the employee benefits contribution cost John Todd Ecological Design is also willing to donate to this project a high quality microscope, *Wild M2Z.*

These contributions are made based on the award of the grant to John Todd Ecological Design only. We appreciate the opportunity to offer these in kind contributions and look forward to working on this exciting project.

Sincerely,

Michael Carr
Director of Operations
John TODD ECOLOGICAL Design, Inc.




Hydros, Inc.
Environmental Diagnostics

John Todd Ecological Design, Inc.
PO Box 497
1 School Street
Woods Hole, MA 02543

March 10, 2009

RE: Textron Systems Corporation/Mass Military Reservation Superfund Site

Dear Dr. Todd:

Hydros Environmental Diagnostic is interested on working with you on the Trexton Recovery Project at the Mass Military Reservation. Hydros' has years of practical experience in waste water treatment. Our present work with the Town of Bourne Integrated Solid Waste Management Department has dealt with issues similar to those that are facing the MMR. At Bourne and other landfills Hydros has been able to help reclaim useable land surface area while improving conditions.

Hydros is looking forward to collaborating with you on this important project.

Very truly yours,

Steven H. Boyd
President Hydros Inc.

114 Waterhouse Road, Suite C • Bourne, MA 02532 • TEL (508) 759-5994 • FAX (508) 759-1884